

Water Resources of the Broad Basin

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Broad River Basin Council – Meeting #2 (Hybrid)
Spartanburg Community College
April 14th, 2022

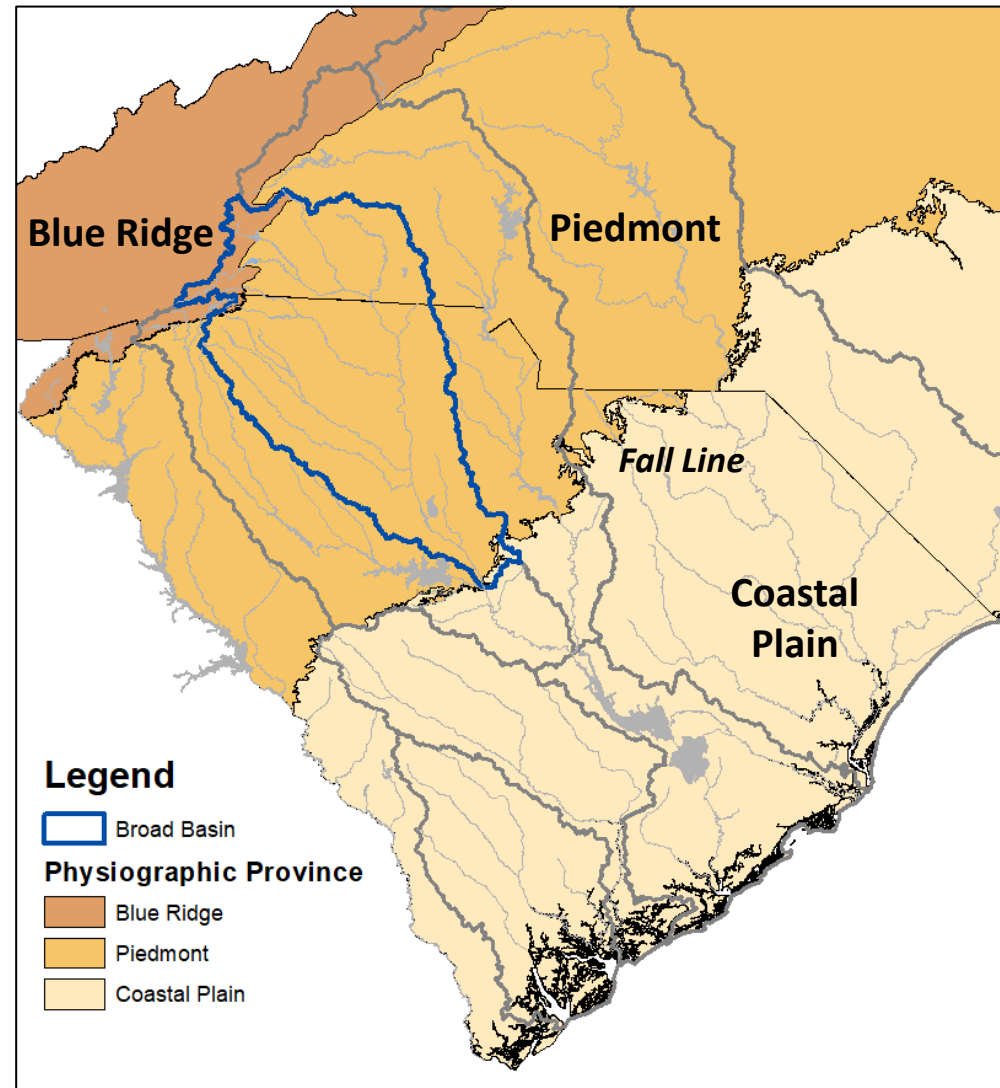


Broad Basin Overview



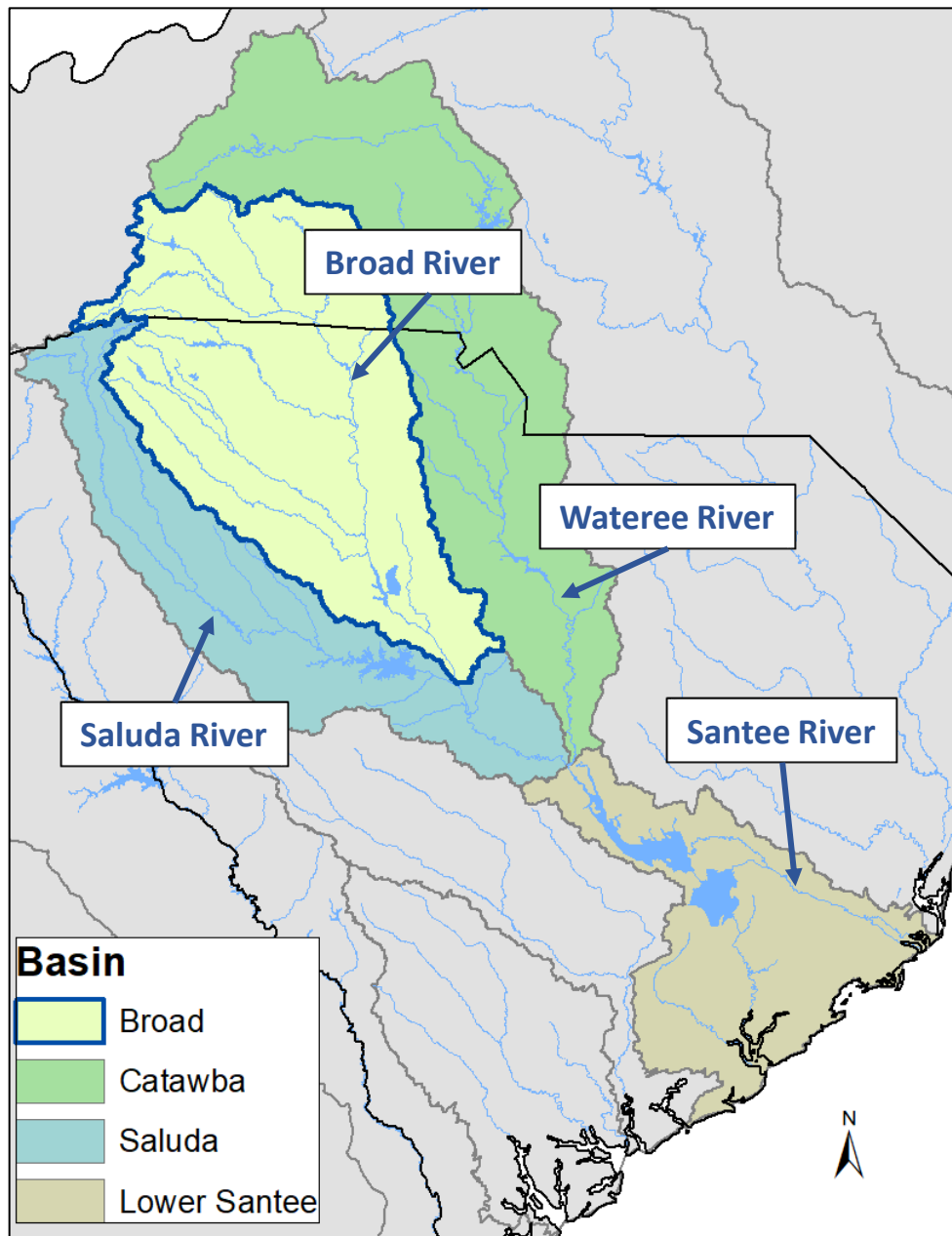
Basin Description:

- 5,300 sq. mi.
- SC portion: 3,800 sq. mi. (12% of SC).
- Mainstem Broad: headwaters originate in the Blue Ridge province.
- Most of basin within Piedmont province.
- Small portion in lower basin extends into the Coastal Plain.
- 166 miles to confluence with Saluda River.



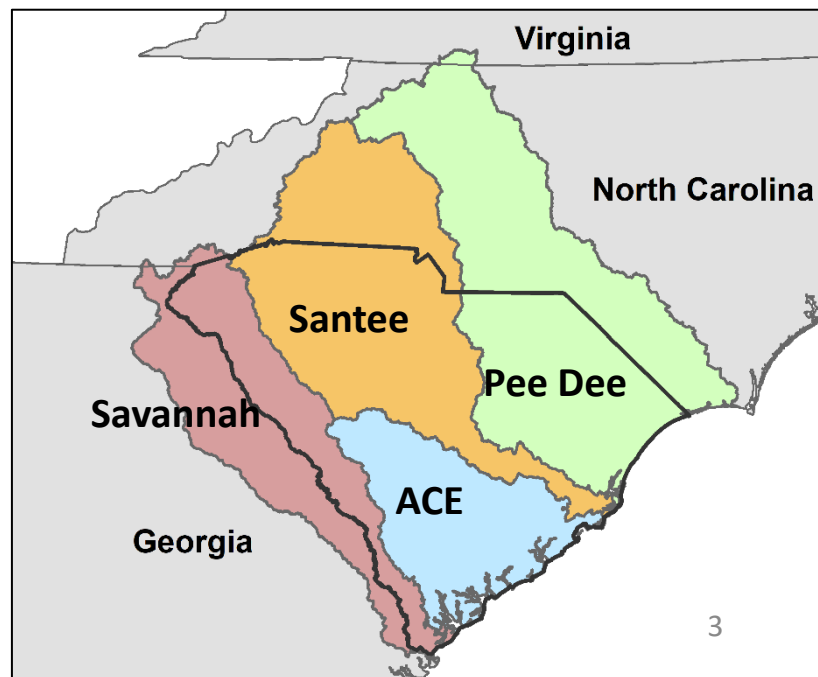


Broad Basin Overview



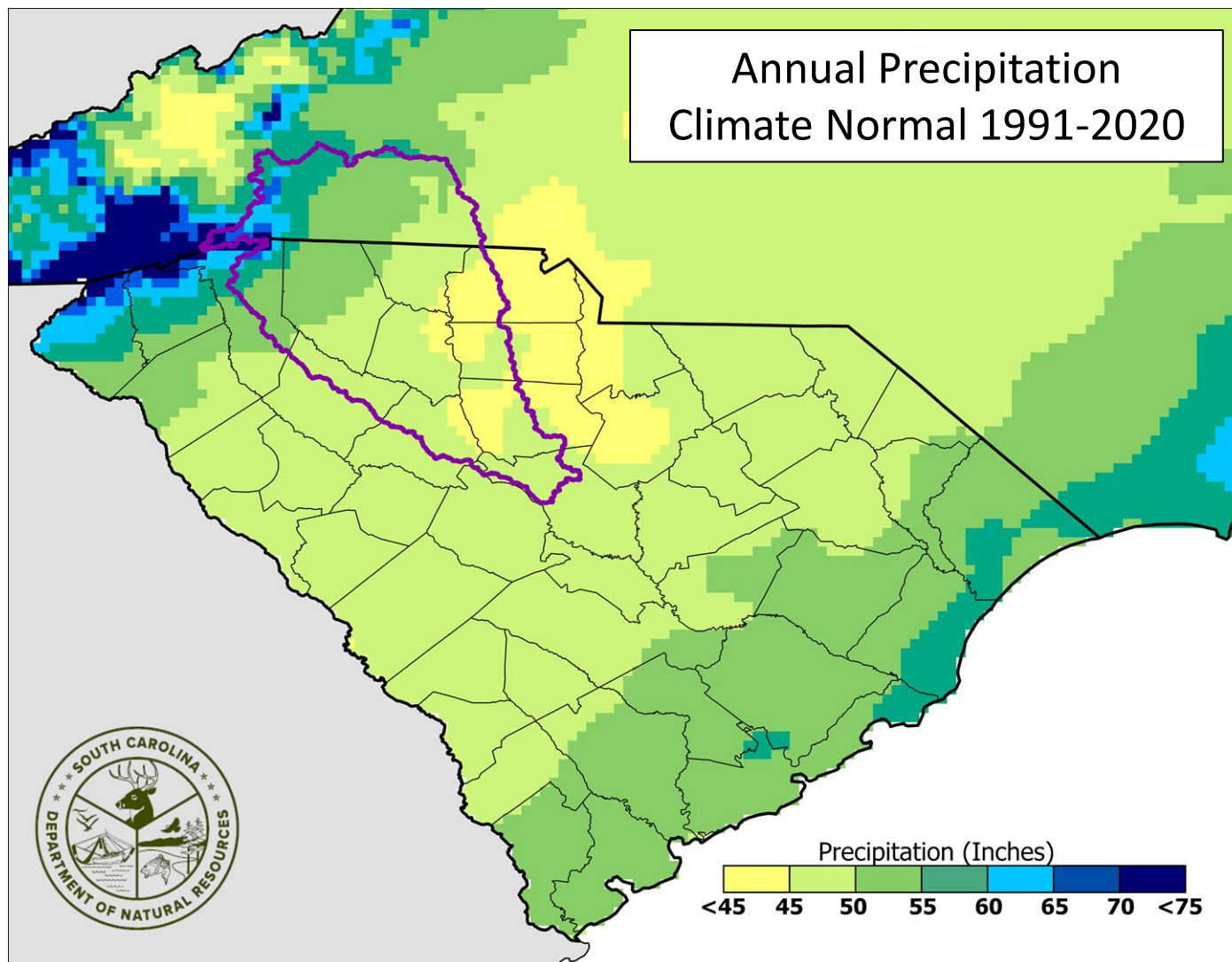
Broad River basin:

- Part of the larger Santee River basin.
- One of three planning basins upstream of the lower Santee planning basin.
- 31% of entire Santee basin.





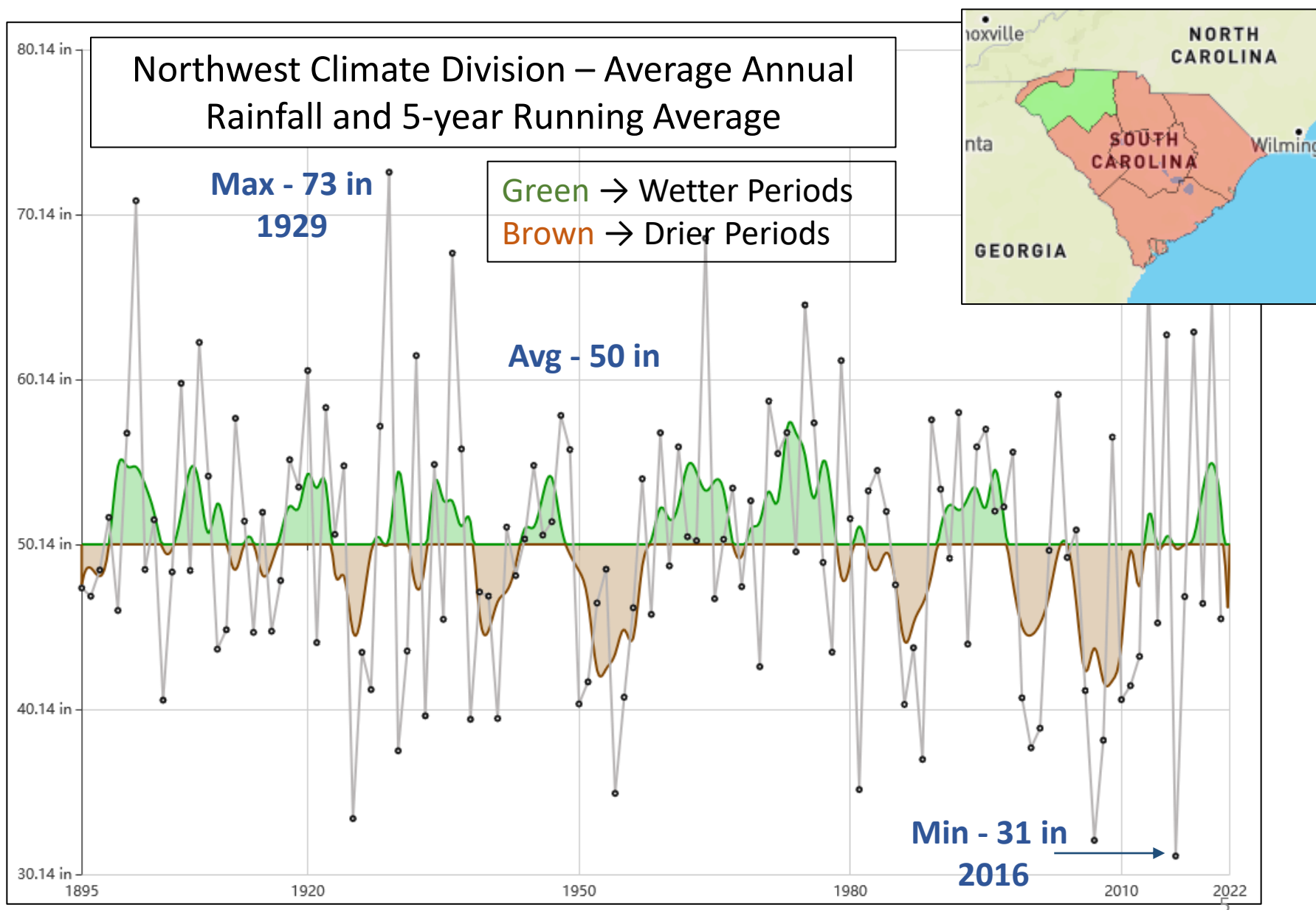
1991-2020 Rainfall – Climate Normal



Average annual rainfall varies from 70" in the upper mountainous regions to 45" in the lower part of the basin.

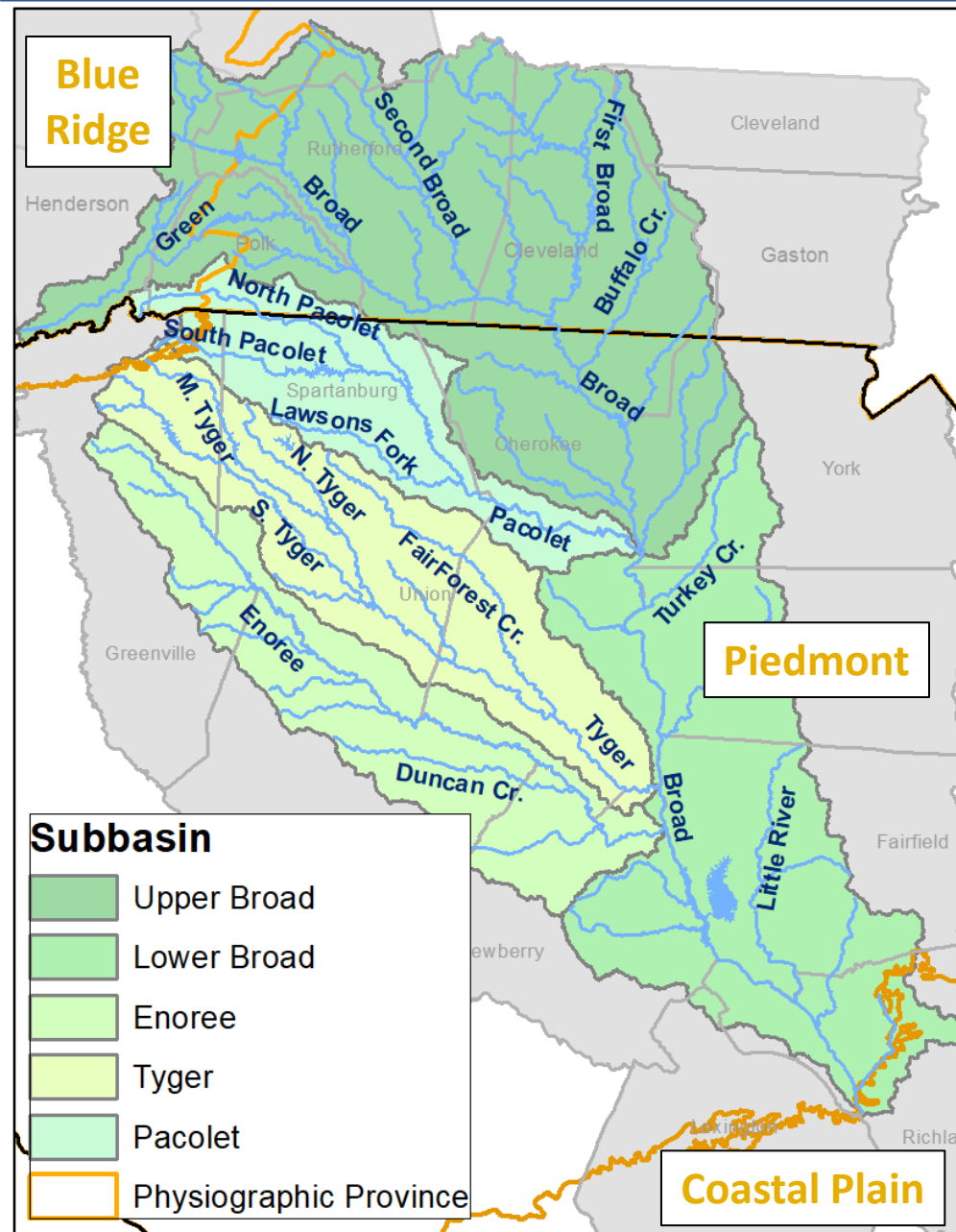


Rainfall Patterns





Broad Basin – Surface Water Resources



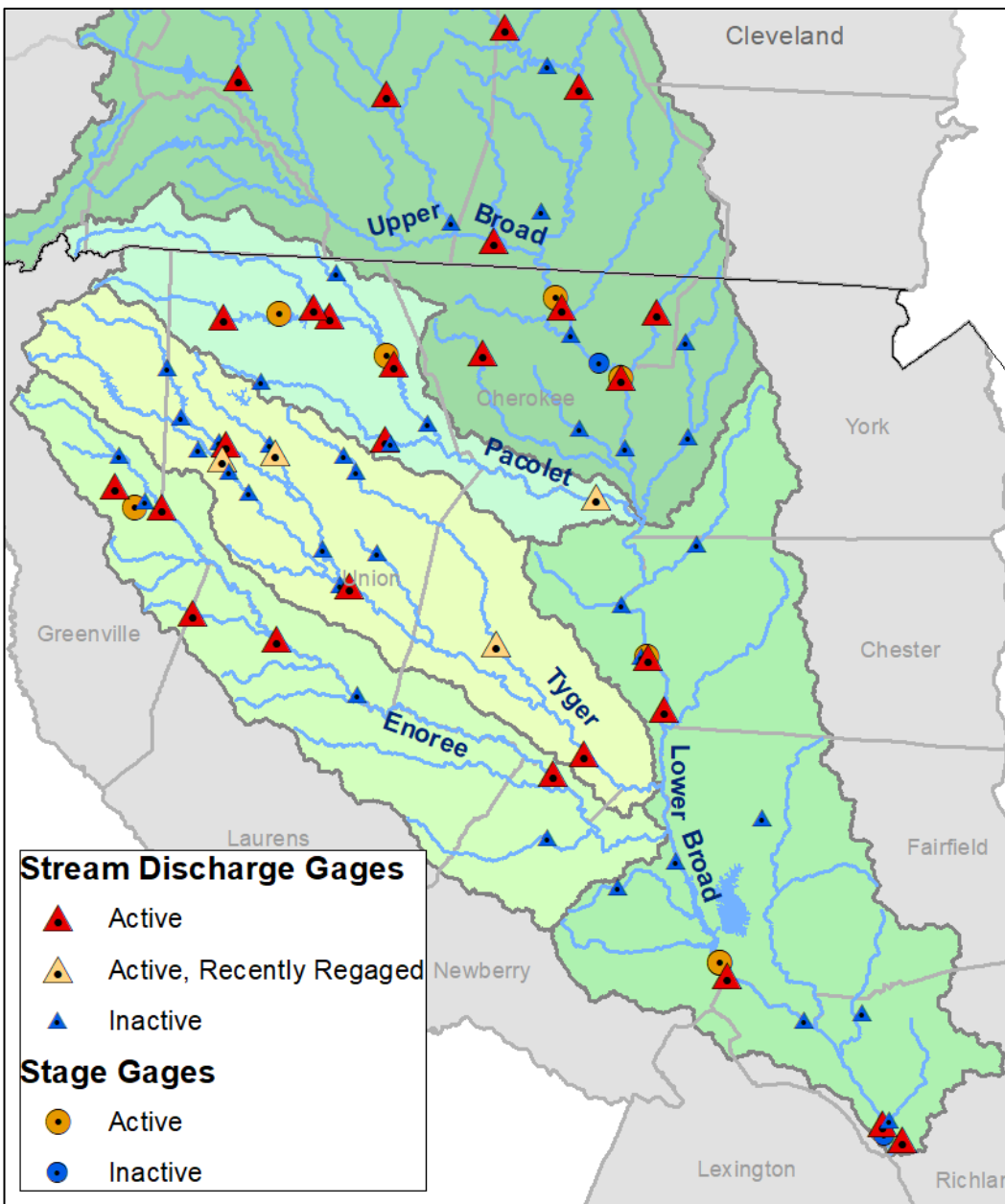
River Systems:

- 5 major subbasins:
 - Upper Broad (1961 mi²)
 - Lower Broad (1288 mi²)
 - Tyger (808 mi²)
 - Enoree (731 mi²)
 - Pacolet (515 mi²)
- Generally higher baseflow/more sustained flow in Blue Ridge/inner Piedmont areas.
- Low to moderate regulation (daily time scales or longer) along mainstem, upper Tyger basin, and Pacolet basin from reservoirs.



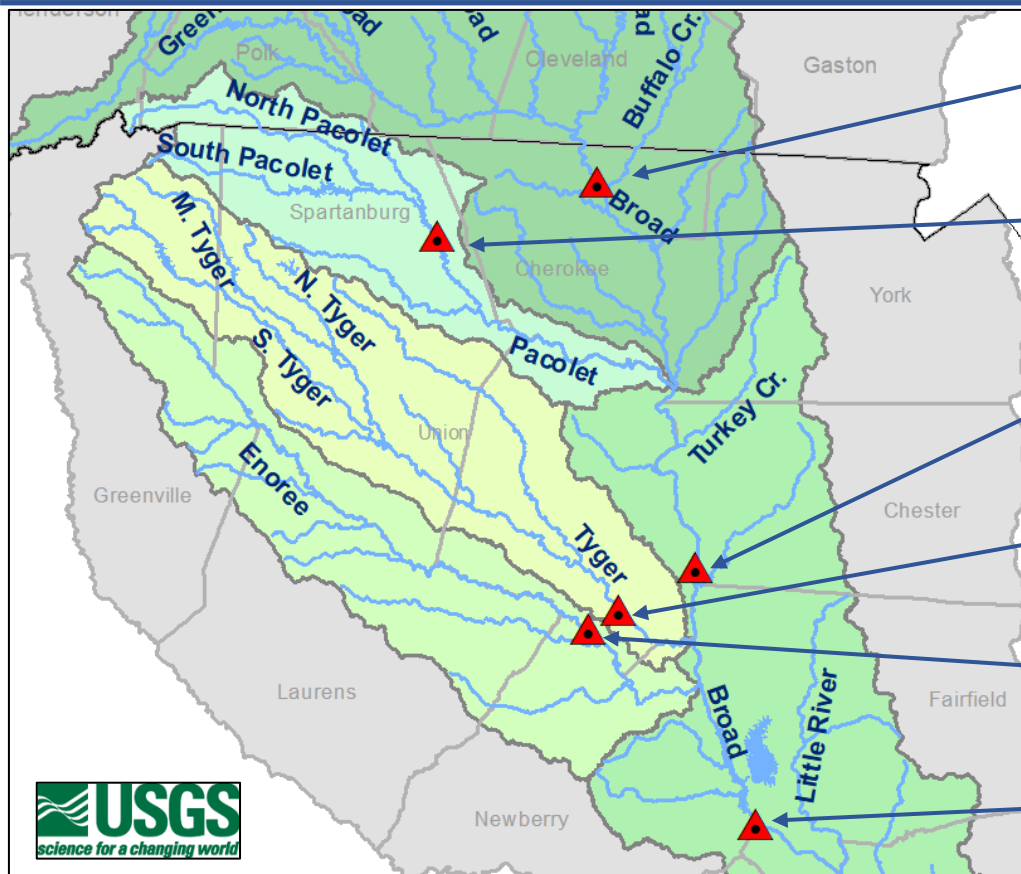
Surface Water Monitoring Network

- Over 30 USGS streamflow gages.
- Longest period of record > 90 years.
- Periods of record extend back to the 1920s for several sites.
- 4 sites recently regaged (South and North Tyger, Fairforest, and Pacolet).





Surface Water Monitoring Network



Broad River - Blacksburg (2153200)

**Pacolet River below Blalock
(21556525)**

Broad River near Carlisle (2156500)

Tyger River near Delta (2156500)

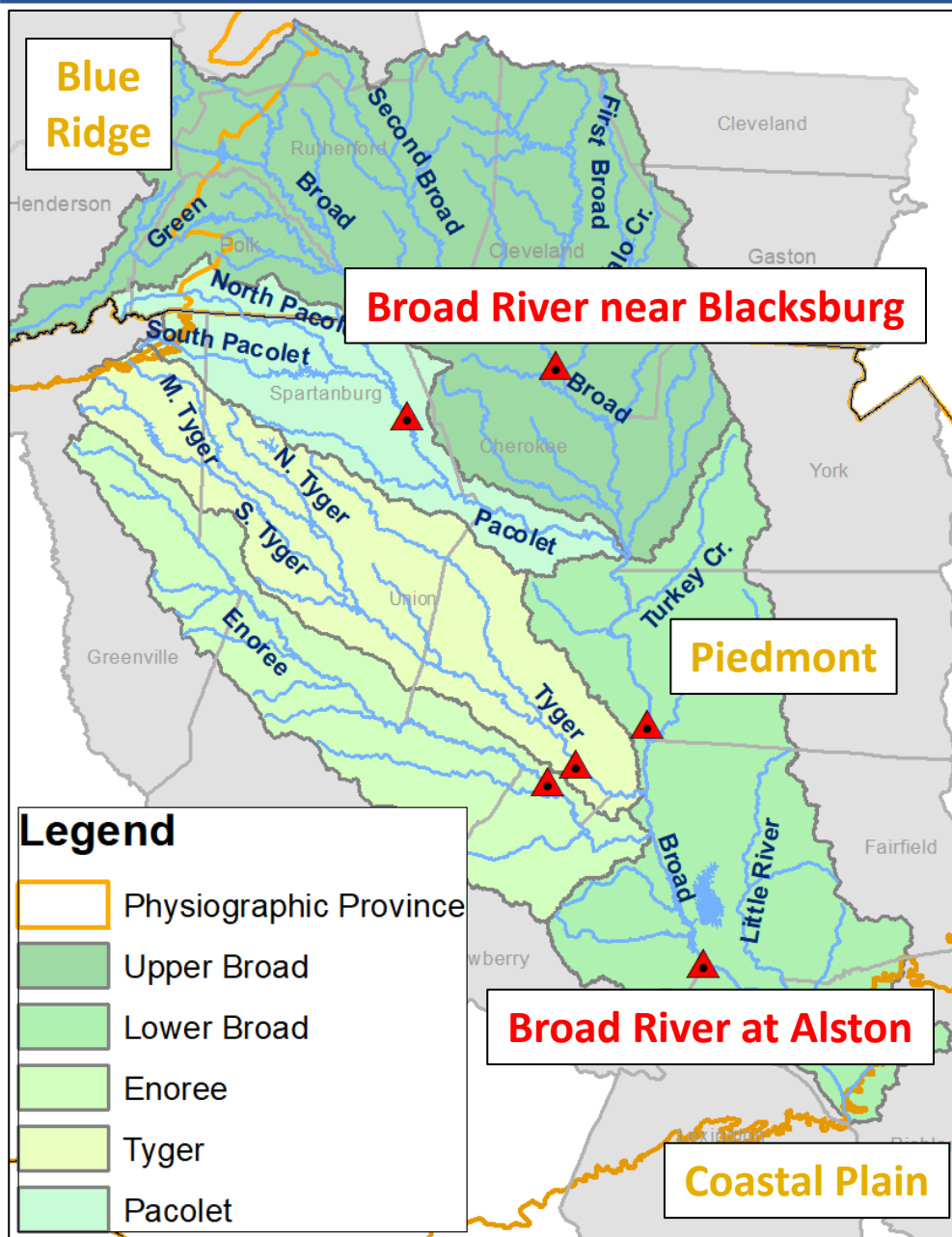
Enoree River at Whitmire (2160700)

Broad River at Alston (2161000)

Gage #	Stream Gage	POR	Mean (cfs)	Min (cfs)	Max (cfs)	DA (sq.mi)
2153200	Broad River nr Blacksburg	1997-2022	1,882	41 (2002)	51,100 (2020)	1,320
21556525	Pacolet River below Blalock	1993-2022	359	28 (2008)	16,100 (2020)	273
2156500	Broad River nr Carlisle	1938-2022	3,756	44 (1956)	114,000 (1976)	2,790
2160105	Tyger River near Delta	1973-2022	889	18 (2008)	26,000 (1976)	759
2160700	Enoree at Whitmire	1973-2022	523	28 (2008)	22,700 (1995)	444
2161000	Broad River nr Alston	1980-2022	5,313	48 (2002)	115,000 (2020)	4,790



Broad Basin – Surface Water Resources



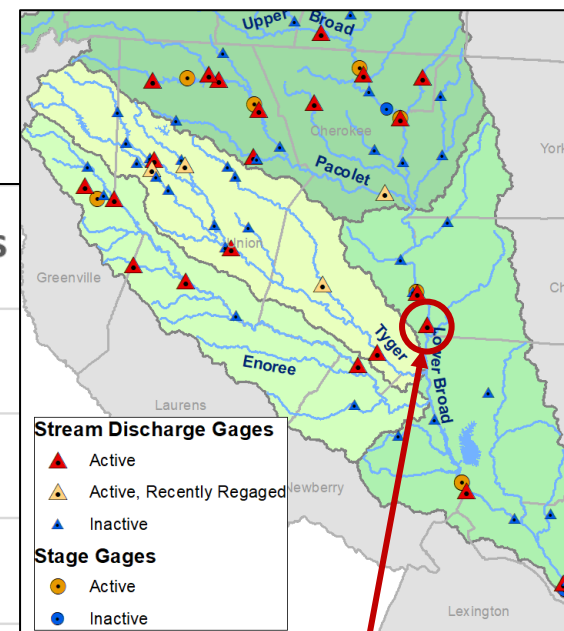
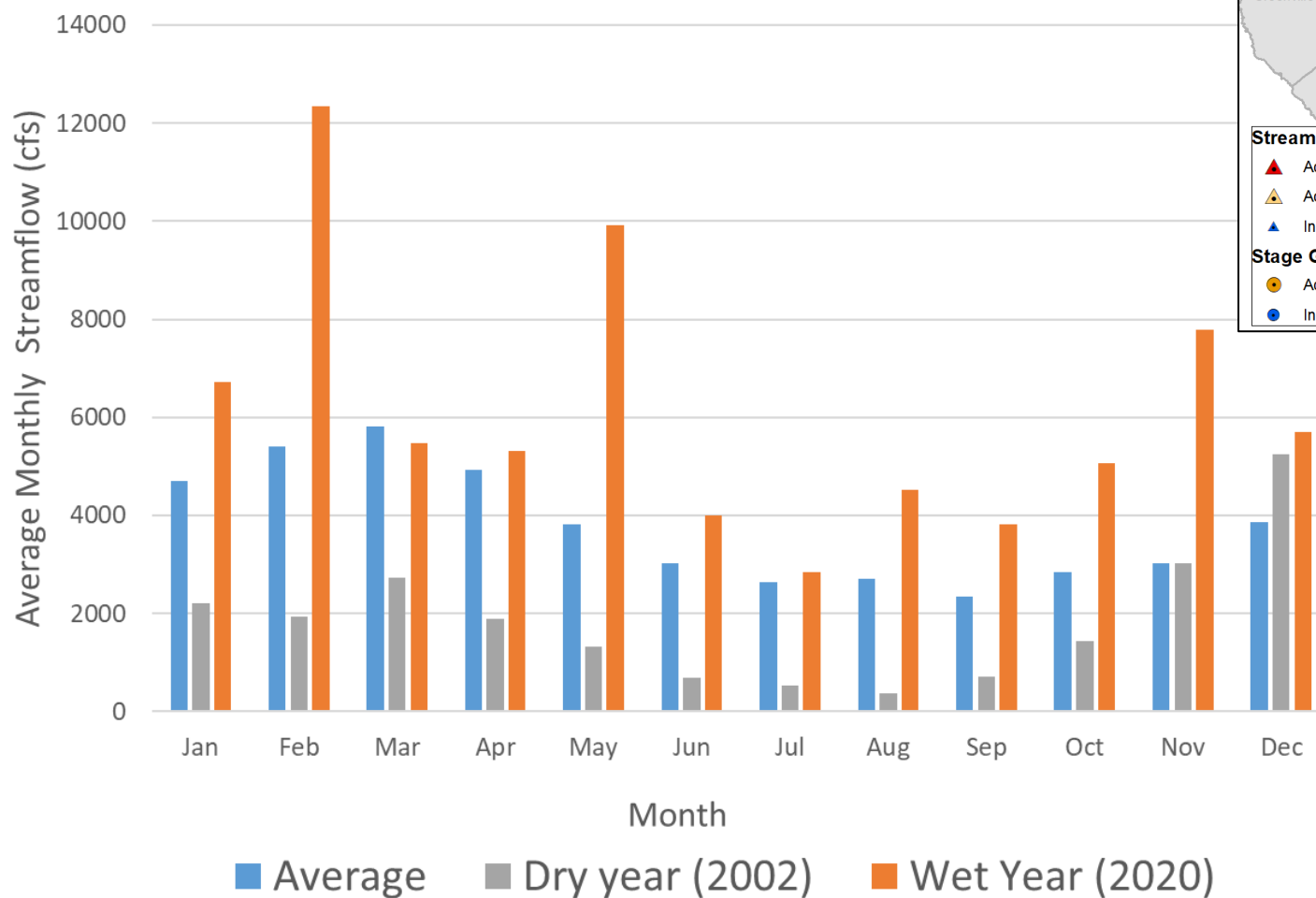
- Broad River at Alston gage represents 90% of basin (approximates outflow).
- Broad River near Blacksburg (approximates inflow from NC): 28% of area, 39% of outflow
- Pacolet basin: 11% of area, 14% of outflow
- Tyger basin: 17% of area, 17% of outflow
- Enoree basin: 16% of area, 15% of outflow
- Higher runoff per square mile in the Upper Broad and Pacolet basins.



Monthly Streamflow Statistics



Broad River near Carlisle (215600) Average Monthly Flows

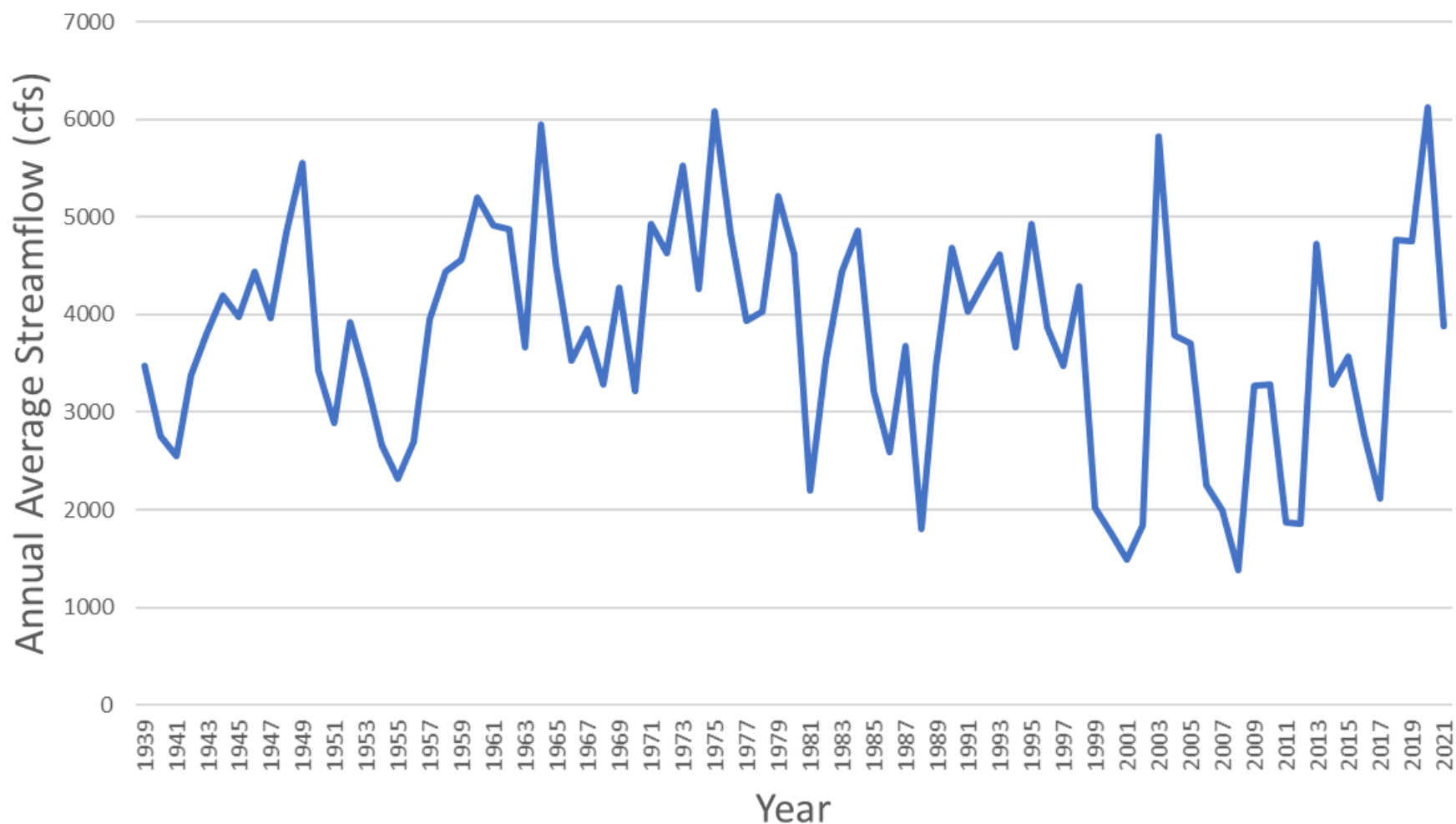


Broad River
near Carlisle
(USGS gage –
2156500)



Annual Average Streamflow

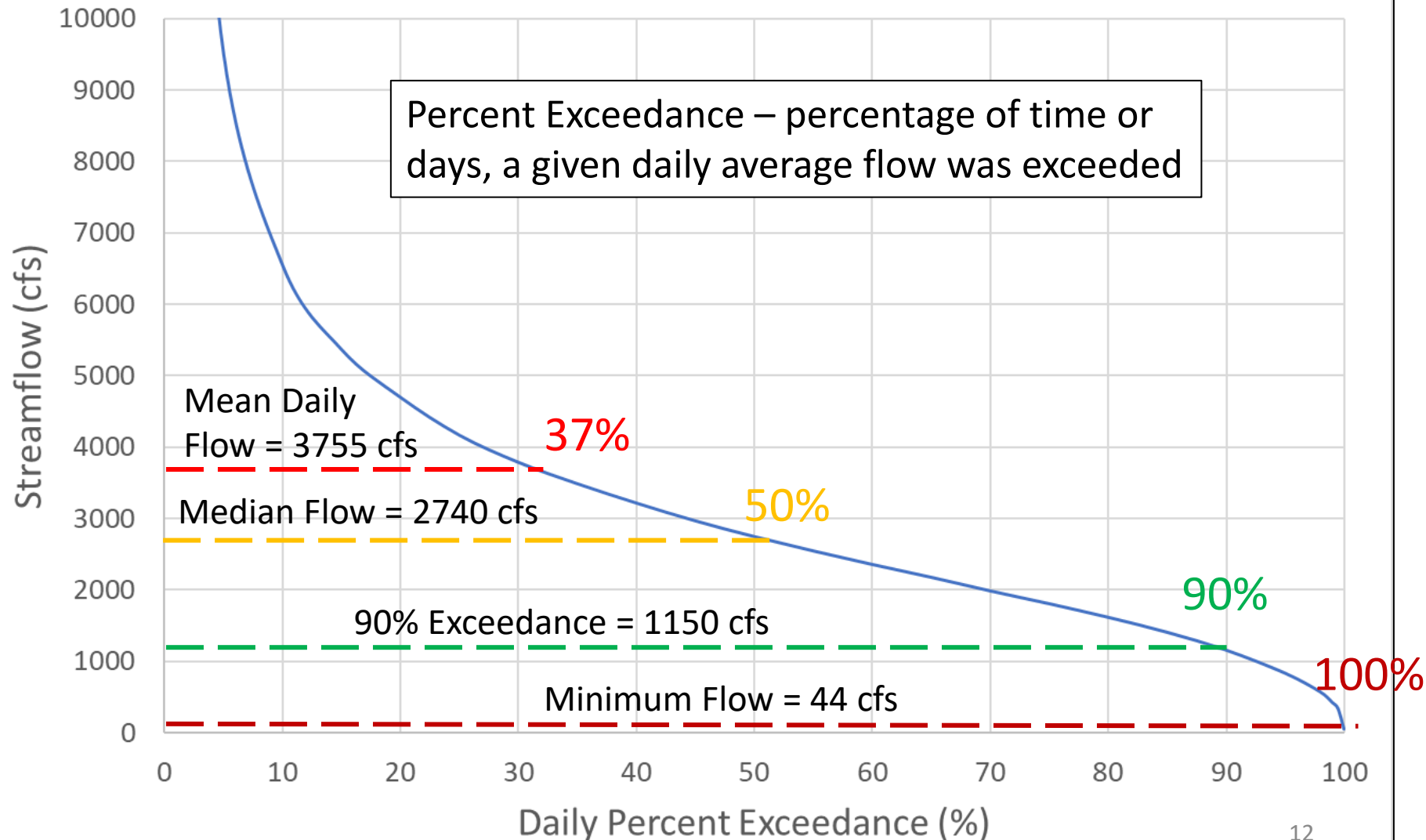
Broad River near Carlisle Annual Average Flows (1939-2021)





Flow Duration Curve

Broad River near Carlisle Flow Duration Curve

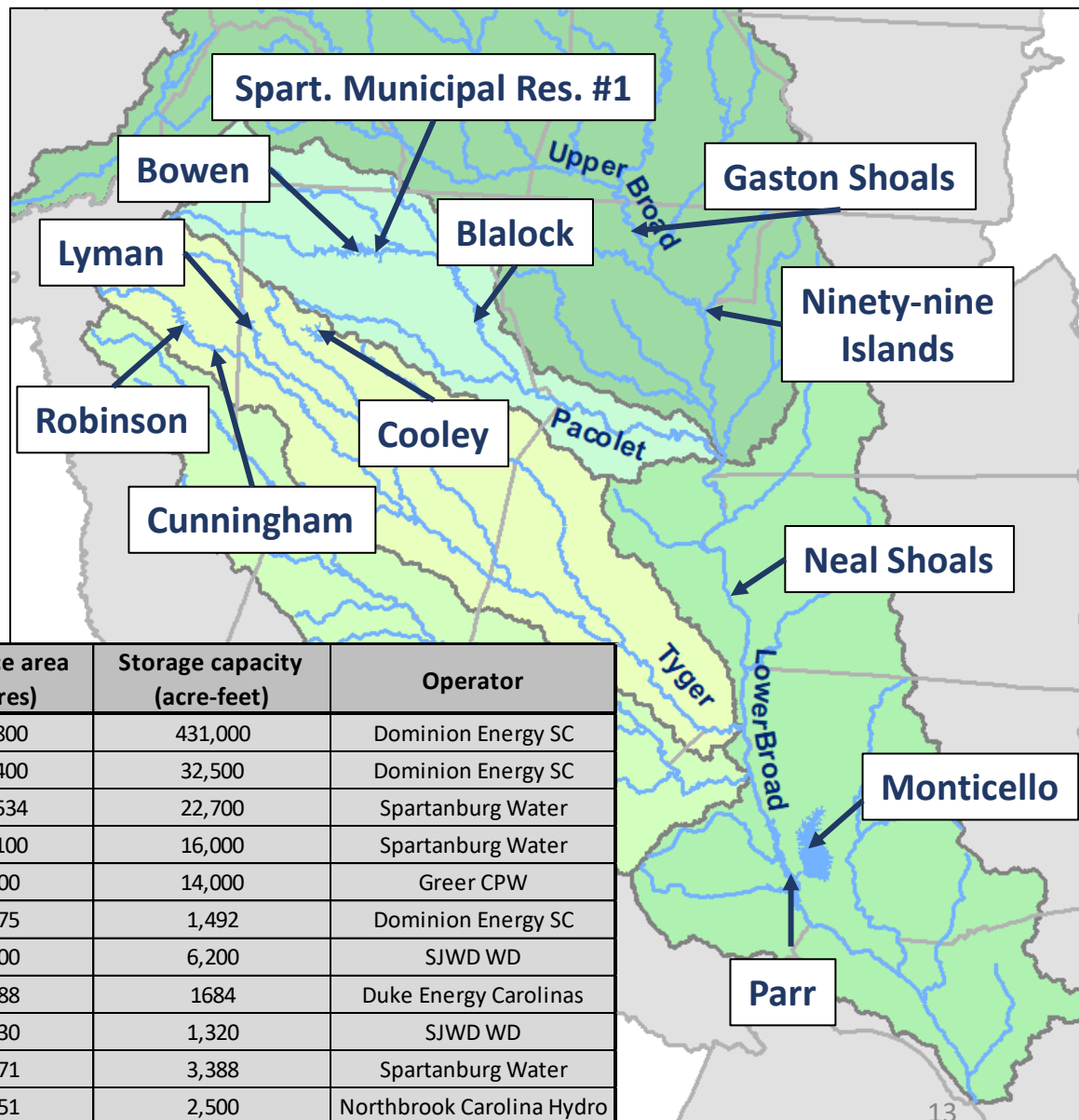




Broad Basin –Surface Water Resources

Reservoirs:

- 12 reservoirs greater than 200 acres (SC).
- Used for hydroelectric power, water supply, and recreation.



Name	Stream	Surface area (acres)	Storage capacity (acre-feet)	Operator
Monticello Reservoir	Frees Creek	6,800	431,000	Dominion Energy SC
Parr Shoals Reservoir	Broad River	4,400	32,500	Dominion Energy SC
Lake William C. Bowen	South Pacolet River	1,534	22,700	Spartanburg Water
Lake H. Taylor Blalock	Pacolet River	1,100	16,000	Spartanburg Water
Lake John A. Robinson	South Tyger River	800	14,000	Greer CPW
Neal Shoals Reservoir	Broad River	575	1,492	Dominion Energy SC
Lyman Lake	Middle Tyger River	500	6,200	SJWD WD
Ninety-Nine Islands Reservoir	Broad River	388	1684	Duke Energy Carolinas
Lake Cooley	Jordan Creek	330	1,320	SJWD WD
Spartanburg Municipal Reservoir #1	South Pacolet River	271	3,388	Spartanburg Water
Gaston Shoals Lake	Broad River	251	2,500	Northbrook Carolina Hydro
Lake Cunningham	South Tyger River	250	2,200	Greer CPW

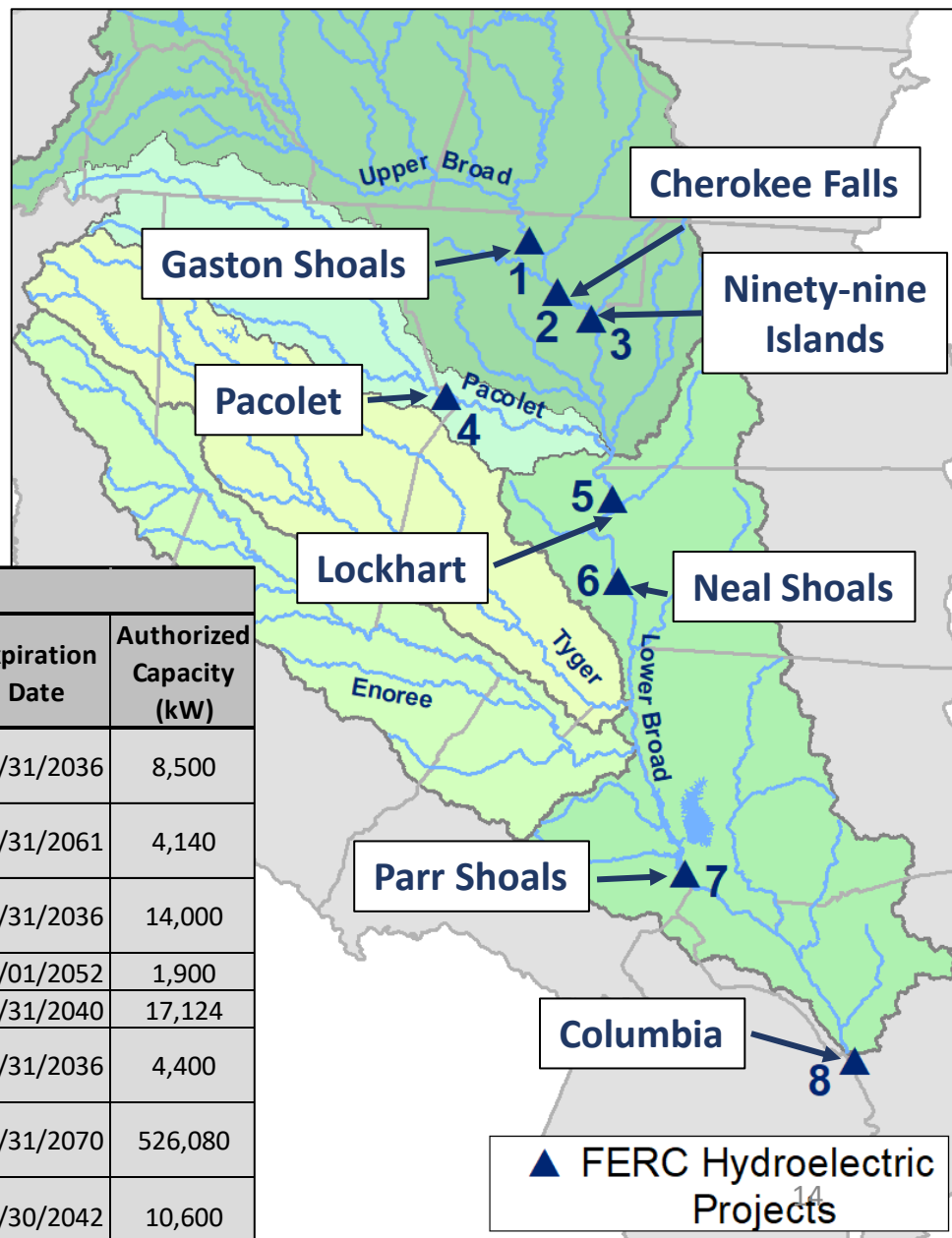


Broad Basin – Surface Water Resources



Hydroelectric Projects:

- Eight projects licensed by the Federal Energy Regulatory Commission (FERC).
- One on the Pacolet, the rest are along the mainstem.



FERC Licensed Hydroelectric Facilities

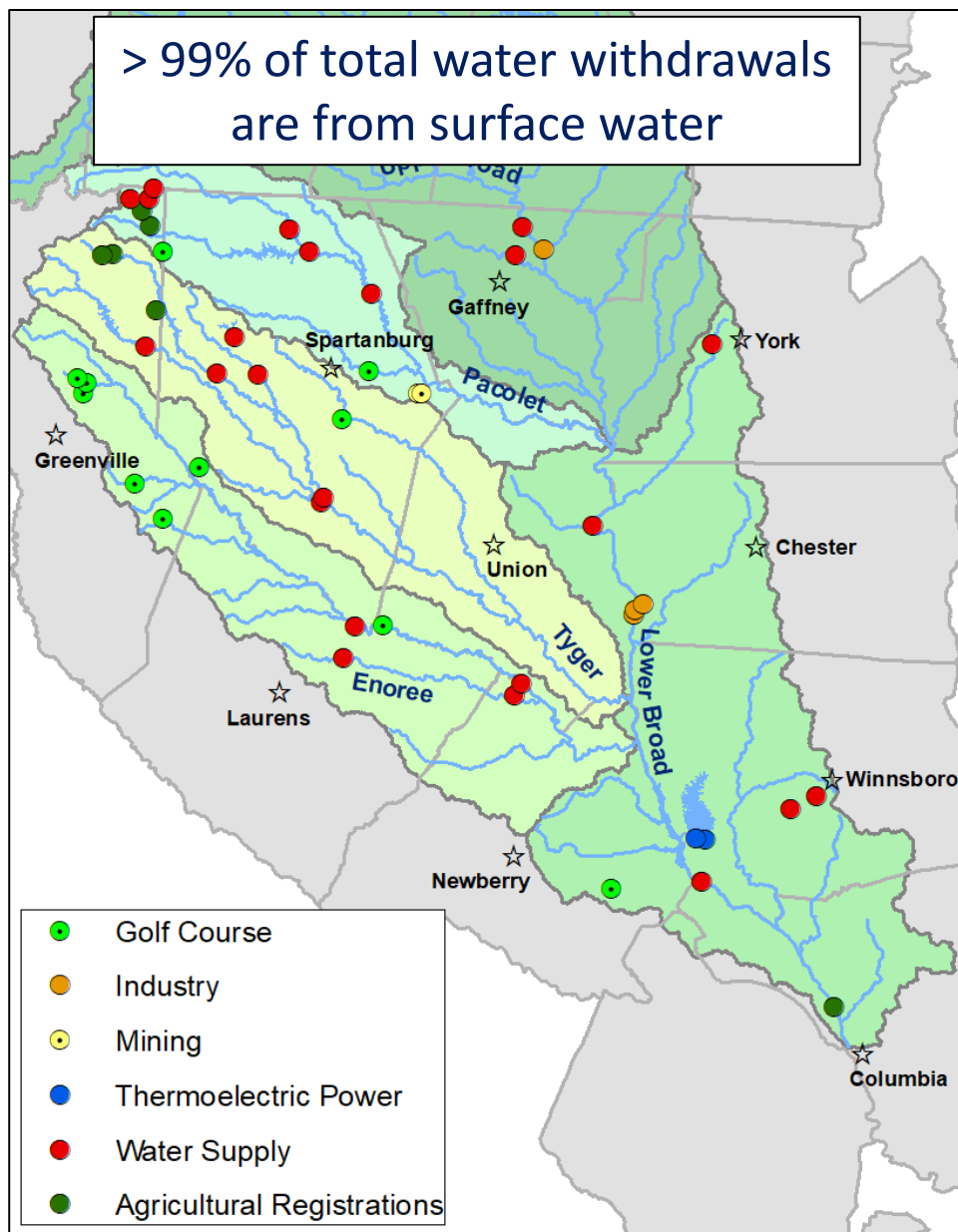
Map ID	Project Number	Project Name	Licensee	Issue Date	Expiration Date	Authorized Capacity (kW)
1	P-2332	Gaston Shoals	Northbrook Carolina Hydro, LLC	06/12/1996	05/31/2036	8,500
2	P-2880	Cherokee Falls	Cherokee Falls Hydro Project, LLC	07/22/2021	07/31/2061	4,140
3	P-2331	Ninety-Nine Islands	Duke Energy Carolinas, LLC	06/17/1996	05/31/2036	14,000
4	P-2621	Pacolet	Lockhart Power Co	07/20/2011	02/01/2052	1,900
5	P-2620	Lockhart	Lockhart Power Co	09/30/1999	03/31/2040	17,124
6	P-2315	Neal Shoals	Dominion Energy South Carolina, Inc	06/17/1996	05/31/2036	4,400
7	P-1894	Parr Shoals	Dominion Energy South Carolina, Inc	11/25/2020	10/31/2070	526,080
8	P-1895	Columbia	City of Columbia, SC	05/30/2002	04/30/2042	10,600



2020 Reported Surface Water Withdrawals

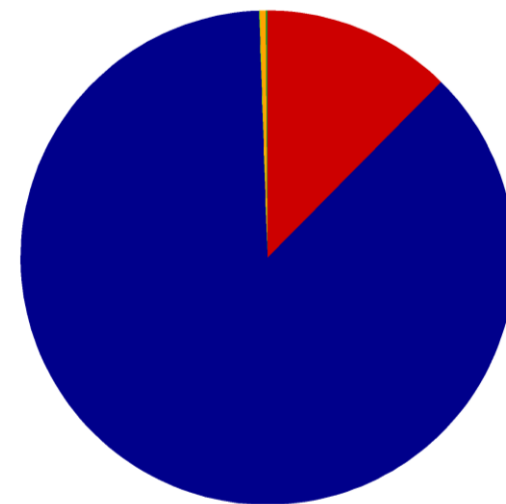


> 99% of total water withdrawals are from surface water



Thermoelectric: 87.0% Water Supply: 12.4%

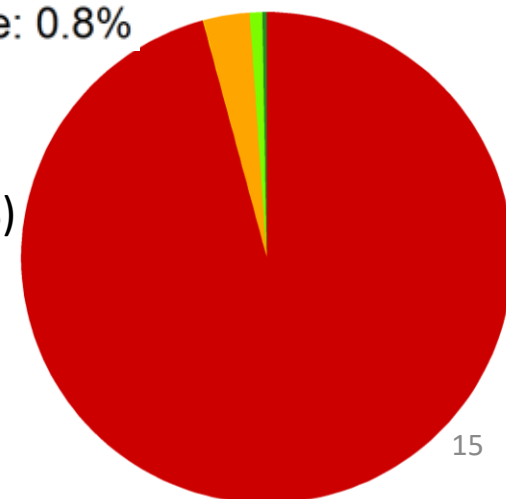
< 1% each:
Agricultural
Irrigation,
Golf Course,
Mining,
Industry



Excluding Energy...

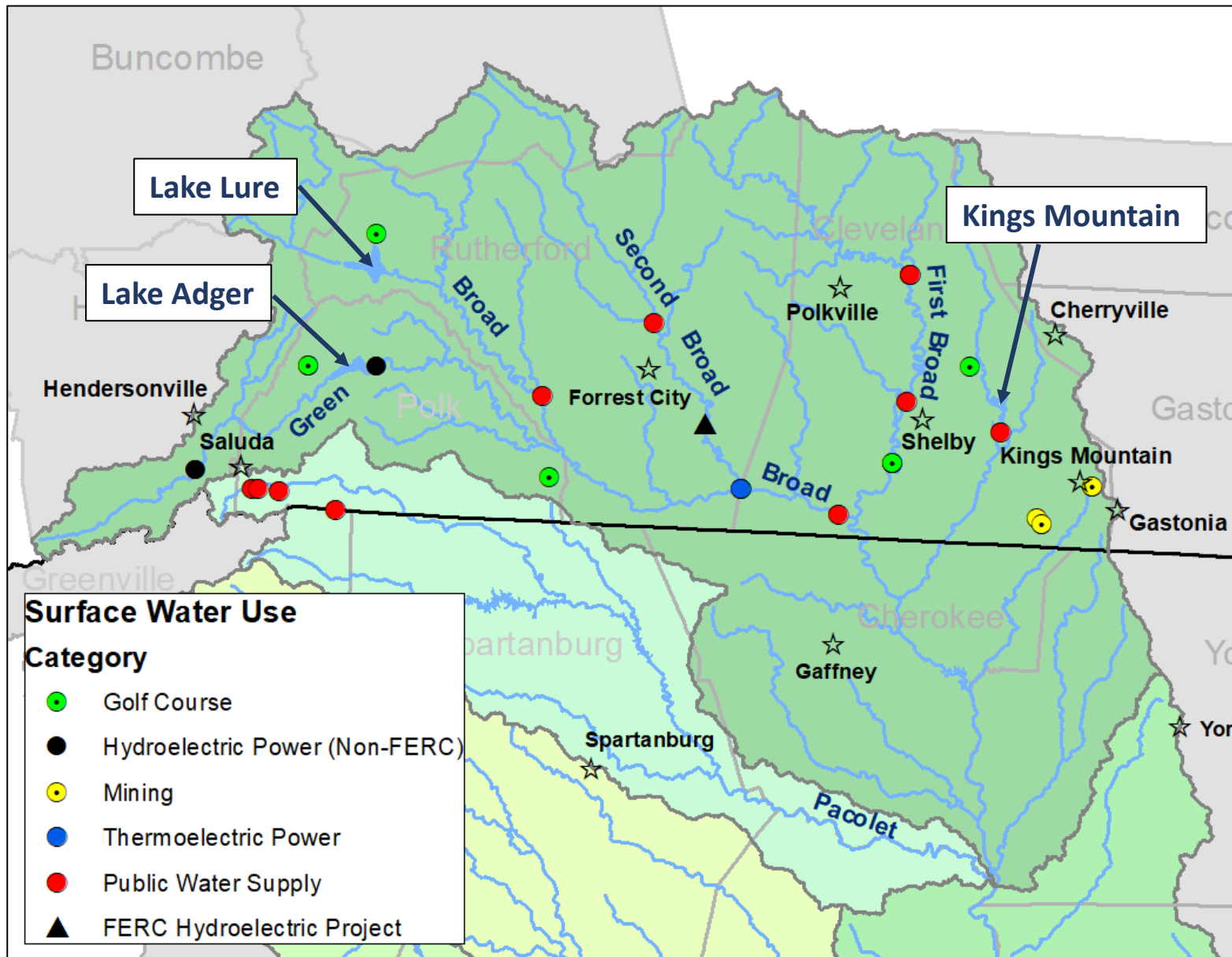
Water Supply: 95.8% Industry: 3.0%
Golf Course: 0.8%

Agricultural
Irrigation (0.3%)
Mining (0.04%)





Broad Basin – North Carolina

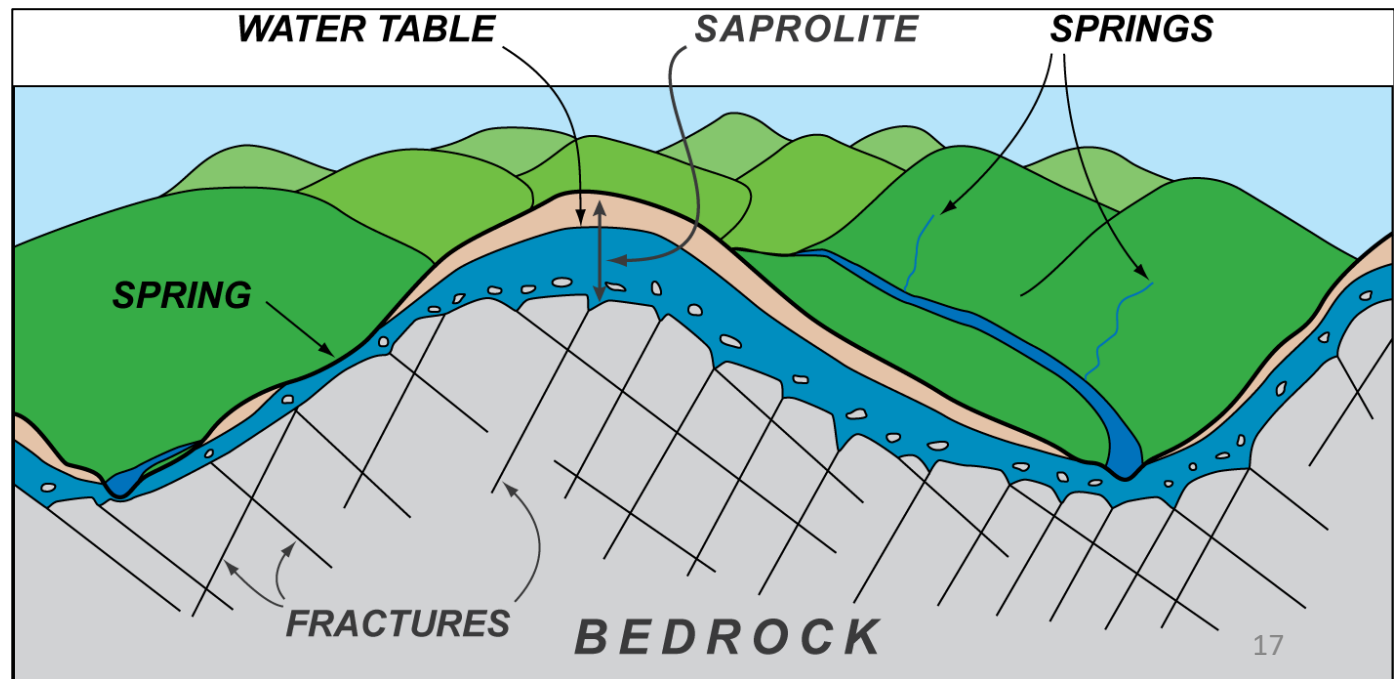




Broad Basin – Groundwater Resources

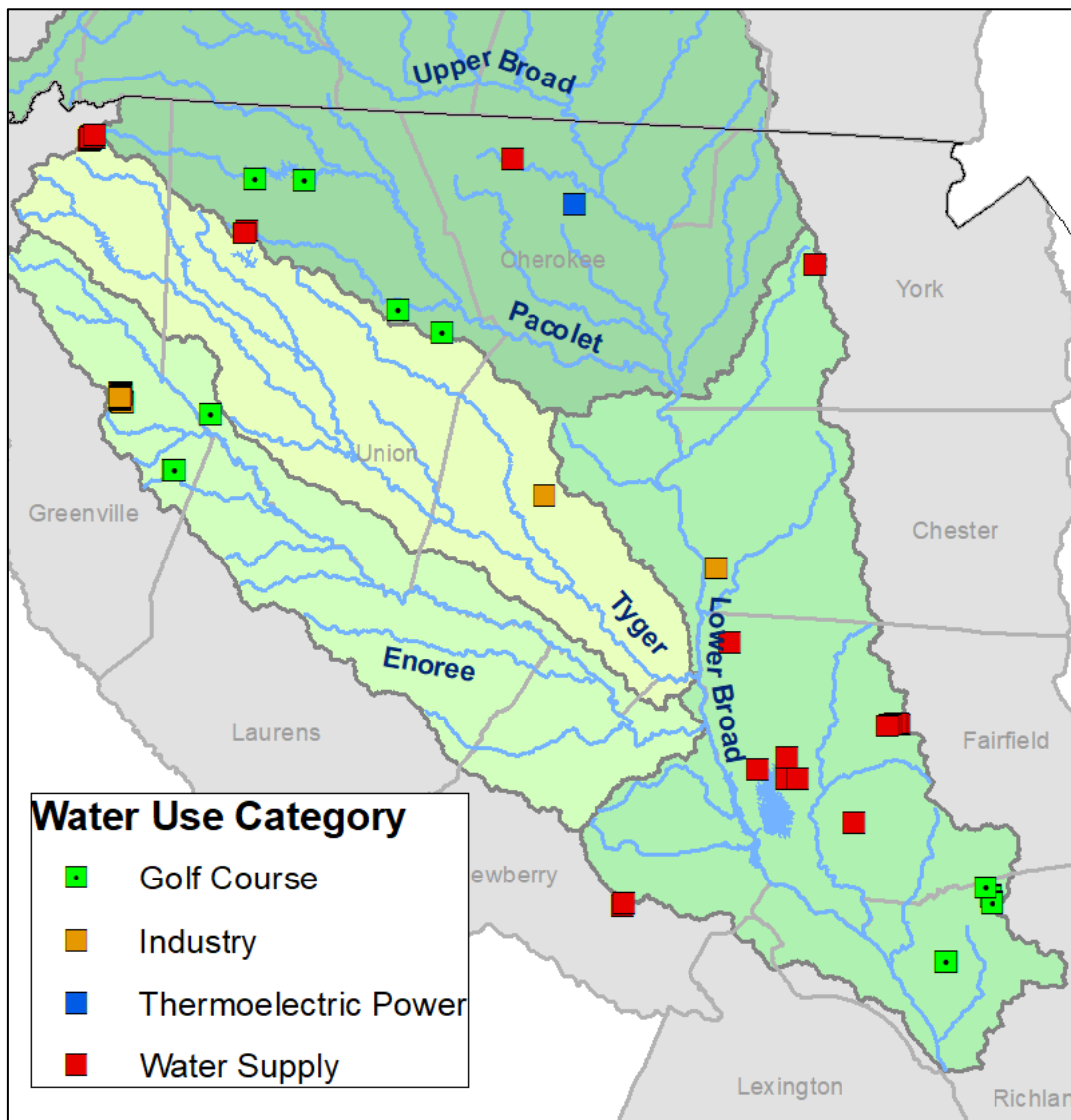


- General geology – saprolite (weathered bedrock) overlying crystalline rock.
- Saprolite tens of feet to 150 ft in thickness.
- Groundwater located in both the saprolite layer and fractured bedrock.
- Higher yields are generally found in bedrock in low lying areas, such as valleys and draws; lower yields on hilltops and hillsides.
- Yields are generally less than 20 gpm.





Broad Basin – Groundwater Use

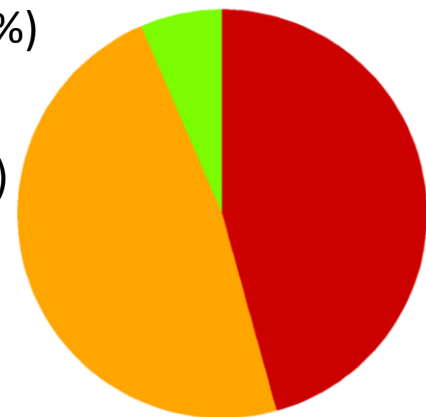


2020 Reported Water Use:

Industry (47.8%)

Public Water Supply (45.7%)

Golf Course (6.5%)



- Reported withdrawals typically < 0.2 MGD.
- Many groundwater withdrawals located near interbasin divides where there are few surface water options.
- Groundwater used heavily for residential use.



Groundwater Monitoring Network

